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10. Partial Differential Equations

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Some mathematical models related to nuclear fusion

We carry out mathematical analysis of a bidimensional non linear stationary problem satisfied by the averaged poloidal flux of the magnetic Field with a constant total current (Tokamak device) and with a current carrying (Stellarator device). We fix our point view in the last case. We obtain a Grad–Shafranov elliptic equation modeling a Stellarator device. That is formulated as an inverse problem since several nonlinear terms of the equation are not a priori known. Using the current balance within each flux magnetic and the notion of relative rearrangementwe reformulate the problem as a nonlocal one but having a direct formulation. We use a Galerkin type method to obtain the existence of a solution. In some sense, we can find a uniqueness result.